

THE SYSTEMATICS OF *CROTAPHYTUS WISLIZENI*,
THE LEOPARD LIZARDS

PART I

A REDESCRIPTION OF *CROTAPHYTUS WISLIZENI*
WISLIZENI Baird and Girard,
AND A DESCRIPTION OF A NEW SUBSPECIES FROM THE
UPPER COLORADO RIVER BASIN¹

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One group of North American iguanid lizards to receive slight consideration for systematic studies has been the leopard lizard, *Crotaphytus wislizeni*. This species has a wide distribution occurring in most of the arid and semi-arid basins of western North America, *i.e.*, Great Basin, Upper Colorado River Basin [Painted Desert], Mojave Desert, San Joaquin Valley of central California, Colorado Desert, Sonora Desert, Chihuahua Desert, peninsular, and to a limited extent, insular Baja California. Throughout this extensive area, populations of *C. wislizeni* occur on the brushy low lands of the valleys, low foothills, and alluvial fans, seldom being found at elevations exceeding 6000 feet above sea level. In contrast to *Crotaphytus collaris*, the collared lizard, *C. wislizeni* is not restricted to rocky rough areas, but occurs where the soils are sandy or of loose gravel. Perhaps the densest populations are found in areas where rodent burrows have provided numerous holes for escape as well as underground tunnels used for shelter (aestivation and hibernation) and perhaps nesting.

We have been amazed that such a large, attractive lizard should escape the attention of systematic herpetologists for so long a time. Since April 1852, when Baird and Girard published the original description, not a single major study has been published on this species. Stejneger (1893) discussed the question of *wislizeni* and *silus*, but was apparently limited by insufficient material. Cope (1900), with the same material available as Stejneger, concluded by placing *silus* as a subspecies of *wislizeni*. Van Denburgh (1922), with additional material from the San Joaquin Valley, was able to describe the juvenile color pattern of *silus*, but did not attack the major problem associated with the variable adult patterns of other populations. Smith (1946) recognized the need to determine if *silus* is a valid species or a subspecies of *wislizeni*. His retention of *silus* as a subspecies of *wislizeni*, following the check list of Stejneger and Barbour (1943), left the problem essentially as it had been for many years.

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This study originated out of an extension of recent efforts which included this species in the Great Basin (Banta, 1963) and the Upper Colorado River Basin (Tanner, 1963). During our independent studies, opportunities were afforded each of us to make comparisons of the *wislizeni* populations from the Great Basin and adjacent areas to the south and east. Resulting from these studies were the independent realizations of the existence of a distinct population of leopard lizards in the Upper Colorado River Basin of eastern Utah and the adjacent states to the east and south, as well as the need to re-define *Crotaphytus wislizeni wislizeni*.

Crotaphytus wislizeni was originally described by Baird and Girard in April 1852 with the type locality listed as "near Santa Fè, New Mexico." Since then the following names have been proposed: *C. gambeli* Baird and Girard, 1852, type locality, "California"; *C. fasciatus* Hallowell, 1852, type locality, "Jornada del Muerte, New Mexico"; *C. copeii* Yarrow, 1882, type locality, La Paz, Baja California Sur, Mexico; *C. silus* Stejneger, 1890, type locality, Fresno, California; *C. fasciatus* Mocquard, 1899, type locality, La Palmas, Baja California, Mexico.

Included in the synonymy of *Crotaphytus wislizeni* of Cope (1900:225) is "*Leiosaurus hallowellii* Aug. Duméril, vol. 8, 1856, p. 533, note 1." We are unable to determine the reason for this inclusion by Cope. We have checked the Duméril report and find that the name *Leiosaurus hallowellii* was proposed as another name for *L. fasciatus*, and although there were discussions of the similarities and differences between *Leiosaurus* and *Crotaphytus*, nowhere did he synonymize *Crotaphytus* with *Leiosaurus*. Guibé (1954:50) also lists *Leiosaurus fasciatus* Dumeril and Bibron, 1837, Erpet. Gen., IV, p. 244, but does not mention *L. hallowellii*.

Baird (1858:253), in the original description of *Crotaphytus reticulatus*, states that it (*reticulatus*) is "more closely related to *Crotaphytus collaris* than to *Crotaphytus (Gambelia) wislizeni*." These same words were repeated by Baird in 1959.³ The use of *Gambelia* as a genus rather than as a subgenus for the leopard lizard was first applied by Smith in 1946. However, this was not widely accepted and Schmidt (1953:117) retained all species in the genus *Crotaphytus*. Robison and Tanner (1962) after examining the skeleton and the muscles of the pectoral girdle, throat, and head of *C. collaris*, *C. reticulatus* and *C. wislizeni*, were also opposed to the raising of *Gambelia* to full generic status. They found that many of the morphological differences existing between *collaris* and *wislizeni* are intermediate in *reticulatus* thus indicating a strong genetic, and, consequently, generic relationship between these three species. Although we believe that Baird's arrangement (i.e., *Gambelia* as a subgenus of *Crotaphytus* to include the leopard

2. Each of the above names, *wislizeni*, *gambeli*, and *fasciatus*, were described in the same volume of the same journal (Proceedings, Academy of National Sciences of Philadelphia, vol 6, on pages 69 (April), 126 (August), 207 (December), respectively.

3. Smith (1946:159) cites Baird (1857:7) as the original description of *Gambelia*.

lizards) should stand, further comparative consideration may be fruitful; we can not, however, pursue it further in this account.

The mutual and almost simultaneous recognition of this problem prompted us to unite our efforts toward an eventual major revision of this species complex. A start was made by comparing samples from the Great Basin with samples from the Upper Colorado River Basin and these in turn with samples from populations to the south. Such preliminary studies provided data which suggested a greater degree of variation in this species than has been previously indicated.

We are not yet prepared to present data covering all segments of the leopard lizard species complex. However, we have seen and examined most of the types (except *Crotaphytus (fasciatus) fasciolatus* Mocquard in the Paris Museum), particularly those types which effect our deliberations concerning populations occurring outside of Baja California. Within the United States, four subspecies of *Crotaphytus wislizeni* seem certain, but before we can determine the designations for the western populations certain nomenclatural problems must be resolved.

We have found that those populations occurring in the Rio Grande Valley of New Mexico and the Upper Colorado River Basin of Utah and Colorado present no major nomenclatural problems, and since both are very distinct, only these two populations will be considered in this report.

ACKNOWLEDGMENTS. Some aspects of this study were begun by the junior author during the tenure of a grant from the National Science Foundation to the Department of Amphibians and Reptiles, California Academy of Sciences (CAS). The examination of type specimens was facilitated by a grant from the Johnson Fund of the American Philosophical Society. The type and many paratypes of *C. w. punctatus* now deposited in the collections at Brigham Young University, (BYU), were obtained during field work conducted by the senior author with support of Atomic Energy Commission, Grant AT(11-1)-819. We are indebted to Dr. Alan E. Leviton for the photograph of the type specimen *C. fasciatus*, fig. 2, and to Mr. Maurice Giles of the California Academy of Sciences for the photographs comprising figs. 1, and 3 through 5.

For assistance offered to examine material, we wish to thank Dr. Richard G. Zweifel, American Museum of Natural History (AMNH); Dr. James Böhlke, Mr. Roger Conant, and Mr. Edmond V. Malnate, Academy of Natural Sciences of Philadelphia (ANSP); Dr. Doris M. Cochran, United States National Museum (USNM); Mr. Neil Richmond and Dr. M. Graham Netting, Carnegie Museum of Pittsburgh (CM); Dr. Robert F. Inger, Chicago Natural History Museum (CNHM); Dr. George S. Myers, Division of Systematic Biology, Stanford University (SU); Mr. Robert G. Crippen and Dr. Robert C. Stebbins, Museum of Vertebrate Zoology, University of California at Berkeley (MVZ); Dr. Laurence M. Klauber, San Diego Natural History Museum (SDNHM); Dr. Alan

E. Leviton, California Academy of Sciences (CAS); Dr. James R. Dixon, New Mexico State University (NMSU); and Dr. Frederick A. Shannon (FAS), Wickenburg, Arizona.

Genus *Crotaphytus* Holbrook

Subgenus *Gambelia* Baird

Crotaphytus wislizeni wislizeni Baird and Girard

RIO GRANDE VALLEY LEOPARD LIZARD

(Figures 1 - 2)

Crotaphytus wislizenii Baird and Girard, 1852, Proceedings, Academy of Natural Sciences of Philadelphia, 6:69,⁴ type locality, near Santa Fe, New Mexico; Baird and Girard, 1852, in Stansbury: 340-341, pl. 3.

Crotaphytus fasciatus Hallowell, 1852: 207-8.

Gambelia wislizeni wislizeni Smith, 1946:159.

Gambelia wislizenii wislizenii Cochran, 1961:105.

Crotaphytus wislizeni wislizeni (new combination) Schmidt, 1953: 117.

TYPE. USNM 2685. (See Remarks).

RANGE. Throughout the Rio Grande Valley of western Texas, northwestern Coahuila, northeastern Chihuahua, and central New Mexico, northwest to near the Utah-Arizona line, west through central and southern Arizona and northern Sonora to the Colorado River.

DIAGNOSIS. Distinguished from all other *C. wislizeni* by several rows of large dark brown dorsal and lateral spots, each with a circle of white dots at or near the outer margin. In adults the light cross bands have faded or have developed into a series of small dots, often included as a part of the circular margin of the spots. The two median rows of brown spots are large, only one spot between the dorsal cross bands and round to ovoidal in shape. Postmentals usually four but ranging from two to six.

DESCRIPTION OF SUBSPECIES. Scales on the body and head smooth, not imbricate; 30 to 50 dorsal, and all ventral scale rows enlarged; lateral scales small, beadlike; basal tail scales smooth, but becoming keeled and spined posteriorly; scales on dorsum of head only slightly enlarged and platelike; supralabials 12 (14.1) 16⁵; infralabials 11 (13.85) 16; dorsals (parietal to base of tail) 179 (196.84) 223; scales at midbody 149 (167.8) 185; ventrals 90 (101.04) 117; femoral pores 18 (20.61) 25, each pore en-

4. Cope (1900, p. 255) cites the article in volume 6 of the Proceedings of the Academy of Natural Sciences of Philadelphia as the original description. However, beginning with the first edition of the check list of North American amphibians and reptiles by Stejneger and Barbour (1917) and continuing through all their editions (1923, 1933, 1939, 1943) the description in the Stansbury report is credited as the original. Smith and Taylor (1950), Schmidt (1953) and Cochran (1961) continued this erroneous usage. See discussion under *Remarks*.

5. Minimum range (mean in parentheses) maximum range.

tered posteriorly by one to three small scales; usually four postmentals, 2 (4.25) 6; gulars small and beadlike.

Head distinct, 22-30 mm. long (base of skull to snout) and 15-20 mm. wide; total length up to 400 mm.; snout to vent lengths 40 (recent hatchling) to 125 mm. in large adult; tail long, 65 to 70 per cent of total length; longest toe in adults (snout-vent of 100 mm. or more) 30 to 40 mm.

The color pattern consists of a juvenile and an adult phase. Both are distinct although variable, and will therefore be described separately.

JUVENILE PATTERN. A series of 7 to 9 well defined cream or white transverse bars occur in parallel sequence extending from the nape to the base of the tail; these bars may be straight, zigzag, or broken medially; dorsolaterally and laterally there are two series of white spots, often appearing as short bars, parallel or alternate

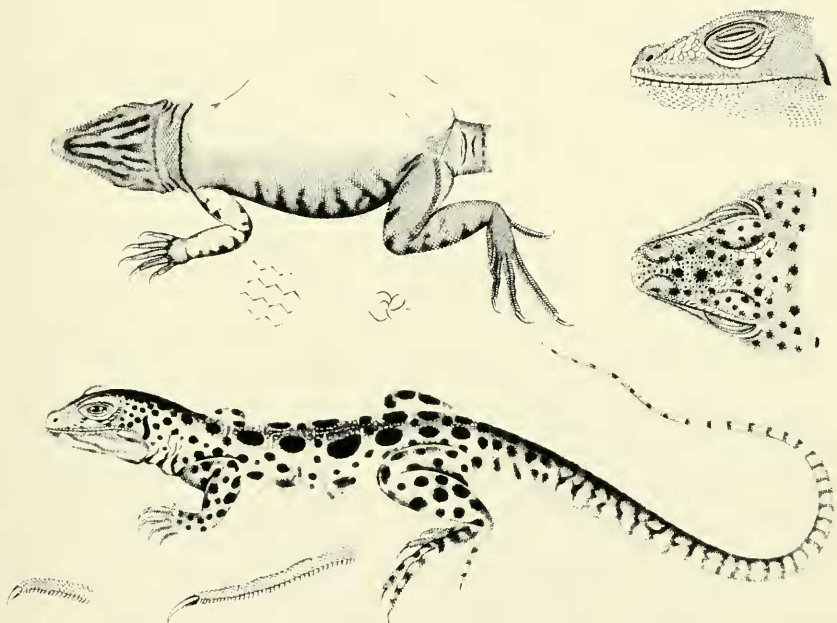


Figure 1. *Crotaphytus wislizeni wislizeni* showing the diagnostic dorsal pattern reproduced from plate 31 of Baird (1859). These drawings were listed as based on United States National Museum specimen 2685 by Baird (1859, p. 7) collected from "Sonora" by "Col. J. D. Graham, U. S. A." The caption from Baird (p. 35) states, "Plate XXXI. Figs. 1-8. - *Crotaphytus* (sic.) *wislizenii*, B. & G. No. 2685. - Fig. 1, animal; fig. 2, head from above; fig. 3, head from the side; fig. 4, inferior surface of body; fig. 5, a fore finger from the side; fig. 6, a hind toe from the side; fig. 7, dorsal scales; fig. 8, a femoral pore. All magnified, except figs. 1 and 4."

with dorsal bars; tail and hind legs also with white bars; white body bars one half to one millimeter long and encompassing 3 to 4 scales in a row; between the transverse bars, and lateral to mid-dorsal line, round brown spots form two rows of 7 to 9 spots on body; lateral spots of irregular size and position; dorsal spots occupy approximately one half of distance between transverse bars. On the posterior margins of white bars, two small dark half circular spots develop immediately anterior to large median spots becoming proportionately smaller in older juveniles and adults; in specimens ranging from 50 - 55 mm. in snout-vent length, a light circle forms around dark median spots; this light circle develops into a circular band of light dots in older lizards. The first adequate description of the juvenile pattern was provided by Ruthven (1907:516).

ADULT PATTERN. Transverse bars between nape and base of tail reduced in width to form narrow stripes, 1 to 2 scales across, or obliterated, usually irregular and confused with other light markings; dorsomedial dark spots large, usually occupying at midbody more than half of distance between transverse bars; usually four rows of smaller lateral spots, and one or two small spots between large medial spots and anterior transverse bar. Around each of spots, medial and usually in the first two or three lateral rows of spots, a conspicuous circle of small white dots (2 to 4 scales in each dot) occur at or near the outer edge; head and tail spots not so encircled; transverse white bars often forming a portion of dotted circles and tending to become more obscure. Ground color grayish brown, light to medium brown or dark brown; ground color variable, reflecting age and population differences.

SPECIMENS EXAMINED. A total of 96 as follows: *ARIZONA*: *Cochise County*: 0.9 miles Southwest of Portal (MVZ) 67023); 31 miles Southwest of Portal (MVZ 6707);. *Gila County*: Gila River (USNM 22130). *Maricopa County*: 2 miles Southwest of Morristown (FAS 6701); 0.75 miles north of Morristown (FAS 6748); Paradise Valley (CAS 17238); 1.5 miles Southwest of Wickenburg (FAS 1355, 1496 and 7502); 3.5 miles Southwest of Wickenburg (FAS 1456); 9 miles West of, 4 miles North of Wickenburg (FAS 12314); Divide, 11 miles West of Wickenburg (FAS 12772); Winter's Well, 15 miles Northwest of Palo Verde (USNM 1474-5). *Mohave County*: Dolan's Spring (MVZ 16020); 0.5 miles West of Hackberry (FAS 7359-61); 7.6 miles north of Wickieup (FAS 16023). *Pima County*: Santa Catalina Mountains (CAS 34320); 9 miles south of Ago (FAS 4849); Tucson (USNM 17180, 19698, FAS 276); Turner's Tanks (USNM 60106); no specific locality (USNM 61378). *Yavapai County*: 10 miles northeast of Aguila (FAS 3008, 15612 and 15614); 9.8 miles northwest of Congress (FAS 11590); 6 miles northwest of Wickenburg (FAS 3442). *Yuma County*: Papago Wells (CAS 34204-8); Yuma (CAS 33486 and 33490).

NEW MEXICO: *Bernalillo County:* Albuquerque (SU 11798-11801; USNM 37961, 38054, 58304-5). *Dona Ana County:* Las Cruces (USNM 22267, NMSU 1489 and R-9); College Ranch near Mexico (NMSU R-3 and R-63); Red Lake, 41 miles north of Las Cruces (NMSU 271-2); 7 miles north of Hwy. 80 (NMSU 1488); 5.5 miles north of Radium Springs (NMSU 2047); 1.4 miles west of Intersection Hwy 359 (NMSU 1487). *Hidalgo County:* Hachita USNM 45067 and 45105); 27 miles north of Rodeo (MVZ 67164). *Luna County:* 0.5 miles east of Columbus (CNHM 51771); Deming (USNM 44956). *Santa Fe County:* near Santa Fe (USNM type and 8475). *Valencia County:* near Grants (SU 5043-4); Laguna (USNM 4274).

TEXAS: *El Paso County:* El Paso (CAS 74036). *Hudspeth County:* Ft. Hancock (USNM 20668); 7 miles southwest of McNary (NMSU 2070). *Reeve County:* 20 miles east of Toyahvale (USNM 32843-4); Pecos River (USNM 5064).

MEXICO: *Chihuahua:* 1 mile south of Ahumada (USNM 104738-40); 6 miles southwest of Rancho Maria (USNM 10471); Rancho Maria, Near Progreso (USNM 104741-50); Santa Maria (CNHM 1639); Lake Santa Maria (USNM 47414); no specific locality (USNM 58036). Sonora: 5 miles northeast of Libertad (CM 4810); northwestern Sonora (USNM 2685 and 431830); Tiburon Island, Gulf of California (SU 17049-50; USNM 64464).



Figure 2. Dorsal view of type specimen of *Crotophytus fasciatus* (USNM 2736) showing its dorsal pattern identical to *Crotophytus wislizeni wislizeni*.

REMARKS: The original description of this species first appeared as a short preliminary note in April, 1852, and is quoted in its entirety as follows:

"*CROTAPHYTUS WISLIZENII*, B. and G. — Head proportionally narrow and elongated; cephalic plates and scales on the back very small; yellowish, brown, spotted all over with small patches of deeper brown or black. Caught near Santa Fe, by Dr. Wislizenus (sic.); specimens of the same species sent in by Lieut. Col. L. D. Graham, collected between San Antonio and El Paso del Norte."

At the beginning of the article containing this description is the following statement: "Full description and figures of these species will shortly appear in Capt. Stansbury's Report to Congress on the great (sic.) Salt Lake (Utah)." As previously stated, Cope (1900:255) was obviously correct in assigning the original description to the April 1852 Proceedings article. The more detailed account in the Stansbury report followed several months later.

The description in the Stansbury Report (1852:340) is general and basically concerned with body proportions and color pattern differences between *C. collaris* and *C. wislizeni*. Although one of the basic dorsal color pattern differences in *wislizeni* is not included in the original description, Baird (1859, plate 31) does show the circle of white spots surrounding each of the large brown spots. This is based upon a specimen from "Sonora," Mexico, (see figure 1 which we have designated as the lectotype). This character was later recognized, in part at least, and reported in the description of *Crotaphytus gambeli* by Baird and Girard in August 1852:126 as follows: "The general distribution of color is the same as in *C. wislizenii*; the only difference consists in the absence of the small yellowish white dots spread all over the body of the latter species. The transverse yellowish markings appear also to be more conspicuous."

There is a question as to whether or not the designation of USNM 2770 is correct. Cochran (1961:105) was apparently aware of this problem as she quoted the following from the "original description:" "Figured specimen caught near Santa Fe. New Mexico, by Dr. Wislizenus." This is a misquote, and should correctly read, "Caught near Santa Fe, by Dr. Wislizenus." Dr. Wislizenus' name was misspelled in the original description and the misspelling was not listed on the "Errata in Vol. VI" of the Proceedings of the Philadelphia Academy. In the more detailed description that appeared later in the Stansbury Report, the name was spelled correctly stating, "The specimen which we have figured was caught near Santa Fe, by Dr. Wislizenus, during the Mexican War." The holotype of *Crotaphytus wislizeni* is listed by Yarrow (1882:53); Cope, (1900:258); Smith and Taylor (1950:94); Cochran (1961:105) as USNM 2770, collected at "Colorado" by H. Baldwin Möllhausen, no date given. Möllhausen was one of two naturalists (the other being Dr. C. B. R. Kennerly) attached to the survey of the

Pacific Railroad Route, under the command of Lt. A. W. Whipple in 1853-1854, (after *C. wislizeni* was described). Yarrow (1882:53) apparently was the first to designate holotypes for the United States National Museum collections and the designation of USNM 2770 as the type must be attributed to him.

The type mentioned, but not designated by Baird and Girard, as obtained by Dr. Wislizenus has presumably been destroyed, according to a recent letter from Dr. Doris M. Cochran. This animal must have been collected around the end of June or early July of 1846. We have checked Wislizenus' account (1848) of his



Figure 3. Dorsal view of the adult pattern of *Crotaphytus wislizeni wislizeni* based upon a specimen from Cochise County, Arizona.

journey across New Mexico, Texas, and Chihuahua, and were unable to find any reference to the specific collection of any reptiles, let alone of a leopard lizard. Since no type specimens were designated in the original and subsequent descriptions, and since the allusion to the specimen obtained by Möllhausen is an obvious error, we must of necessity designate another type specimen. In the original description Baird and Girard stated, "specimens of the same species sent in by Lieut. Col. J. D. Graham, collected between San Antonio and El Paso del Norte." Baird (1859, plate 31) was

the first one to actually show the dorsal color pattern of *C. w. wislizeni* based upon USNM 2685 from "Sonora" obtained by "Col. J. D. Graham, U.S.A." Because this specimen is still available in the collections of the United States National Museum and owing to the fact that specimens from "between San Antonio and El Paso del Norte" obtained by Colonel Graham were mentioned in the original description, we take the liberty of designating USNM 2685 as the holotype for *C. wislizeni wislizeni*. This is necessitated by the fact that the allusion to the specimen obtained by Möllhausen, USNM 2770 as the type, is an obvious error.

We are aware of the problems involved in specifically designating localities listed by the early survey reports. Areas included in Sonora, Utah, etc., do not have the same boundaries today. It is common knowledge that the names of many areas have been changed with the advance of history and what was once alluded to as "Sonora" in the 1850's may now be portions of New Mexico, Arizona, Chihuahua or Sonora. Although the state of Sonora, Mexico, as it is now constituted, is included in the range of *Crotaphytus w. wislizeni*, it is questionable that any of the type series used by Baird and Girard were actually collected in Sonora as recognized today.

Other studies (Van Denburgh, 1922, pl. 8; Smith 1946, p. 160, pl. 30) have shown the color pattern as described above, but seemingly have not recognized its significance. Ruthven (1907, p. 516) perhaps came closest to describing the pattern of the circle of white dots around the darker and larger spots in specimens of *Crotaphytus wislizeni wislizeni* from Alamogordo, New Mexico, and Tucson, Arizona, than any previous author. (Fig. 3).

Crotaphytus wislizeni punctatus, new subspecies

SMALL SPOTTED LEOPARD LIZARD

(Figures 4-5)

TYPE. An adult female, BYU 20928, taken in the Yellow Cat mining District approximately 10 miles south of U.S. Highway 50-6, Grand County, Utah, by Wilmer W. Tanner on 28 June 1961.

PARATYPES. COLORADO: *Mesa County*: Grand Junction (USNM 44793-5). UTAH: *Emery County*: approximately 15 miles northwest of Hanksville (BYU 16497 and 20931-3); Green River (CAS 38376); 25 miles northwest of Hanksville (BYU 14913); 5 miles west of Temple Mountain Junction (BYU 20934-9; CAS 92466-9 and 93358). *Garfield County*: Star Spring (BYU 12846); one mile east of Star Spring (BYU 11742 and 12187); mouth of North Wash (BYU 12558); Trachyte Creek at Junction of Utah Highway 95 (BYU 12614-17); six miles south of Wayne-Garfield county line on Utah Highway 95 (BYU 12685). *Grand County*: 10 miles south of Cisco (BYU 12857, 12859-600); Castle Valley (BYU 12853); Moab (BYU 11363); Arches National Monument (BYU 9040-1, 10243 and CM 20765-6, CNHM 62810); Yellow Cat Mine

(BYU 20610 and 20920-30); Thompson (CAS 38217-34, 41131, 41133-5); Elgin (CAS 38343-4); *Kane County*: Hall Cave (BYU 122, 924-8); 15 miles northwest of Hole-in-the-Rock (BYU 11271); Lone Rock (BYU 11325, 12008 and 14981); Willow Spring tank (BYU 114); Catstare Canyon (BYU 11347-8, 11329-30, 11378-81, 12186, and 12873); Crossing of the Fathers (BYU 14912). *San Juan County*: Bluff (BYU 482); Navajo Mountain Trading Post (BYU 12554); Green Water Spring (BYU 16751); Montezuma Creek (BYU 16797-8); Copper Canyon, 3 miles north of old mine (MVZ 21792). *Wayne County*: Hanksville (BYU 8396-7).

OTHER MATERIAL. *ARIZONA*: *Coconino County*: Wahweap Creek (MVZ 21793); one mile west of Glen Canyon Dam (BYU 18920); 16 miles west of Marble Canyon Bridge (MVZ 16383); Marble Canyon (BYU 556); Tuba City (BYU 555 and MVZ 8663). *Navajo County*: Joseph City (BYU 12782-3). *UTAH*: *San Juan County*: two miles above mouth of Nokai Creek (CNHM 37419). *Sevier County*: two miles south of Joseph (MVZ 49711-2). *Washington County*: Ivans (BYU 6801); Saint George (BYU 515 and 1635).

DIAGNOSIS. Similar in habits to other adjacent populations of *Crotaphytus wislizeni* but distinct in having a dorsal color pat-

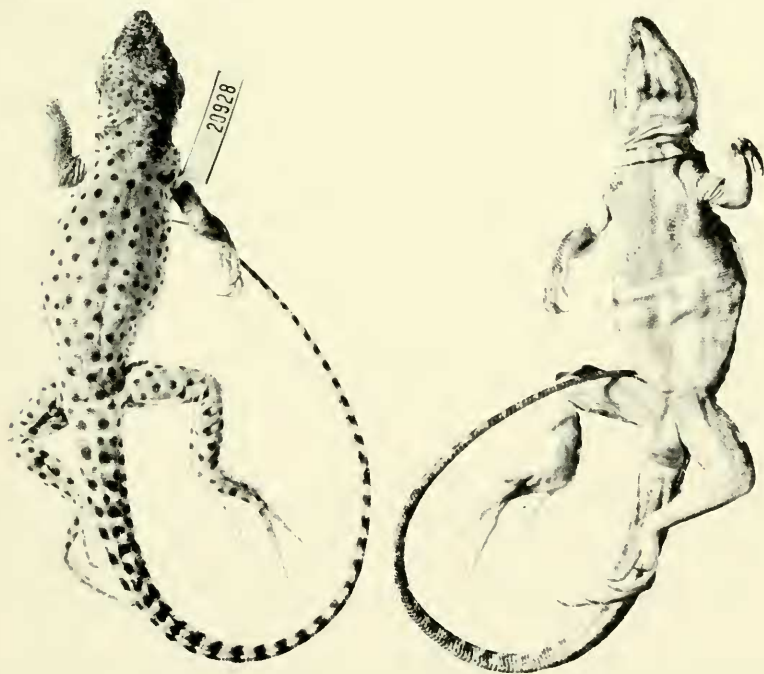


Figure 4. A. Dorsal view of holotype of *Crotaphytus wislizeni punctatus*. (BYU20928). B. Ventral view of holotype.

tern of numerous, small, round brown spots on a background of light brownish gray and with the transverse bars reduced to narrow or faint lines in adults. In contrast to some populations occurring in the Great Basin and Baja California to the west and southwest, to all *C. w. wislizeni* in Arizona, New Mexico and northern mainland Mexico, the dorsal brown spots are not encircled by white or cream colored spots at or near their margins. Only a limited degree of dorsal pattern polymorphism seems to occur. (see fig. 5). Furthermore, *C. w. punctatus* is distinct from all other subspecies in having an increase in postmentals from 4 to 6. (see fig. 6).

DESCRIPTION OF TYPE. An adult female, snout vent 104.5, total length 309.5 mm., tail into total length .6624; orbit to rostral 8.3; orbit to ear 9.2; dorsal scales (occipital scale to base of tail) 212; ventrals 102, noticeably larger than laterals and dorsals; scales around middle of body 175; middorsal rows only slightly enlarged, beadlike; supralabials 17-18; infralabials 15-16; femoral pores 22-23; one to three usually two, small scales contacting pores posteriorly; dorsal head scales from rostral to occiput 22; postmentals 4 right side, 3 left side, 7 total; scales on anterior half of tail smooth, posteriorly keeled but not spinous. Head scales smooth and platelike, some raised medially, none imbricate; gular scales elongate anteriorly, becoming rounded and beadlike before and at the gular fold; ventrals enlarged, imbricate and in approximately 35 longitudinal rows.

Head distinct, 24.8 mm. long, 20.5 wide; body slightly flattened, wider than high; longest toe 20.0 mm. Color pattern consisting of a series of nine transverse bars from neck to base of tail, greatly faded, not distinct anteriorly; dorsal and lateral spots small, involving 7 to 16 scales; 10 to 12 spots on one side between two transverse bars; lateral spots smallest, tail with two dorsal and two lateral rows of spots, larger than body spots and becoming progressively larger posteriorly until they fuse to form black and white rings; gular region marked with seven parallel dark stripes extending from labials to near gular fold where they terminate; dorsum of hind legs spotted and colored as body; front legs with gray body color but without spots; body ground color gray (see remarks); brown spots distinct.

RANGE. Upper Colorado River Basin in Utah from Uintah County through Emery to Kane and Washington counties on the west and south; southeast through western Colorado to northwestern New Mexico and west along the northern edge of Arizona (north of the Little Colorado and the Colorado River at least to Toroweap in Mohave County).

REMARKS. The dorsal pattern in the subspecies of *C. wislizeni* appears to have four important variables in the adults: (1) the general background color; (2) number and size of dorsal dark

spots; (3) the size of the dorsal transverse bars; and (4) the presence or absence of other dorsal markings such as the fine light dots surrounding the brown spots in *C. w. wislizeni*.

Based upon the three subspecies now recognized the following remarks are appropriate. The background color is lightest in *C. w. punctatus* and darkest in *C. w. silus*. In the latter the scales are mostly dark brown or tending toward black, but in *C. w. wislizeni* there are lighter shades and a tendency for the base of each scale (not included in a brown spot) and the skin between scales, to be much lighter than the crown. In *C. w. punctatus*, this is carried still further in some specimens with only the top of each scale pigmented. This produces a blending or fusion of the basal white and

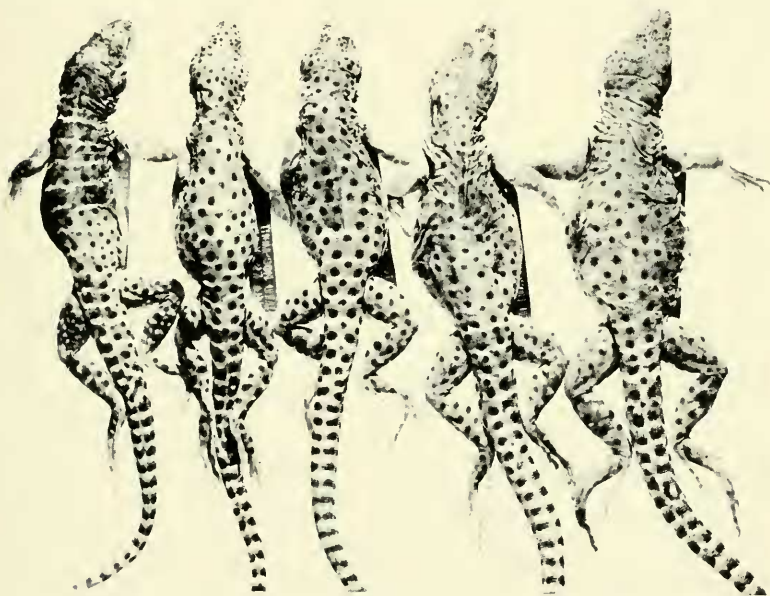


Figure 5. The limited range of dorsal pattern polymorphism of *Crotaphytus wislizeni punctatus* as indicated by a portion of the paratypic series from Thompson, Grand County, Utah.

the dark dot on the crown of each scale into a gray or brownish ground color. This factor, in addition to (or combined with) the size of the dorsal spots, determines in a general way whether the lizard will have a dark (*silus*) or light (*punctatus*) appearance. The light colored appearance of other segments of the Upper Colorado River herpetofauna was first commented upon by Van Denburg (1922).

The number of spots is perhaps not as variable as their size, although in *punctatus* the spots are not only smaller but also more numerous than in *wislizeni*. A comparison of *wislizeni* with specimens from Nevada and California, including *silus*, indicates that

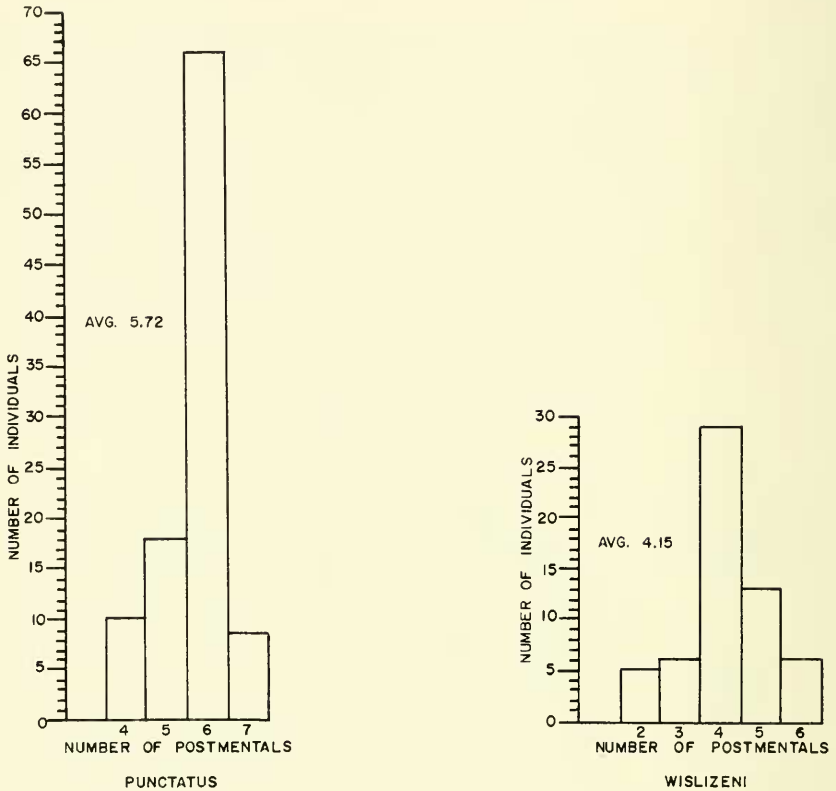


Figure 6. Histograms showing the numbers of postmentals in A., *C. w. wislizeni* and B., *C. W. punctatus*.

the size of spots rather than the number of spots is the variable. This is also generally true for the transverse bars, with *silus* having wide distinct bars and the eastern subspecies, *punctatus* and *wislizeni*, narrow, faint (even to forming a discontinuous series of dots), to a complete absence of the bars in old adults.

Perhaps the most ornate character in the dorsal pattern is the development of the circle of white dots around the dark rust brown spots. (Those having this character well developed, are, in our opinion, one of temperate North America's most attractive and beautiful lizards). This character is present in *C. w. wislizeni* as we have defined it and has been observed in specimens from northern Baja California (San Andreas), southern California and extreme south and eastern Nevada. It may, therefore, be necessary to extend the range of *C. w. wislizeni* to these areas as additional material indicates more adequately the extent of the actual geographic ranges.

Specimens of *C. w. punctatus* from central Sevier County, Utah, represent the only known records outside of the Colorado

River Basin. Their occurrence here is not surprising for it is known that other reptile species (e.g., *Sceloporus undulatus elongatus*) have penetrated the eastern margins of the Great Basin, presumably through Salina Canyon.

Specimens seen from Washington County, Utah, are also *punctatus*; however, a few specimens from the western part and north along the Nevada line to Iron County show traces of the white dots (see Van Denburgh 1922b, plate 8). There is also a reduction in the postmentals with four being most common.

Intergradation between *C. w. punctatus* and *C. w. wislizeni* also appears to occur in central Coconino County, Arizona. Specimens from the Tuba City-Cameron area show faint but definite tracings of the white circle of dots around the dark spots, but have six postmentals and small spots and are considered to be closer to *C. w. punctatus*.

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6. Brackets [] denote specific pages of text pertaining to *Crotophytus wislizeni*.

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